Precision Planetary Gears Type HTRG

The HTRG product range of precision planetary gears is the outcome of years of experience in the industry, and is the culmination of a decade-long dedication to performance enhancement.
Comprising a wide range of low backlash planetary gearboxes, the units come in a range of precision classes up to 3', and are available in seven gear frame sizes, with one or more reduction stages for gearing ratios from 1:3 to 1:1000.

Double shaft, right angle shaft and right angle output shaft versions are also available.

All this, combined with tens of motor mounting adapters held in stock, mean we can quickly respond to the most diverse application requirements of our customers.

The gears can be mounted directly or by means of adaptor flanges on most of the JVL integrated servo and stepper motors as well as on the wide range of other motors from JVL.
This datasheet shows the HTRG types of gear boxes which JVL normally has in stock for JVL motors and often delivered types.

If a special type of gear box, a special ratio, less backlash, angled types etc. is not shown in the datasheet and is needed, then contact JVL Industri Elektronik and we'll find a type or a solution.

	Unit	HTRG05	HTRG06	HTRG08	HTRG10	HTRG13	HTRG16	HTRG19
1 stage	mm (in)	Ø55x<78 (2.17x<2.8)	Ø65x<83 (2.56x<3.28)	Ø85x<118 (3.35x<4.65)	Ø106x<156 (4.17x<6.14)	Ø138x<196 (5.43x<7.72)	Ø155x<200 (6.10x<7.87)	Ø180x<229 (7.09x<9.02)
2 stages	mm (in)	Ø55x<92 (2.17x3.35x)	Ø65x100 (2.56x3.94)	Ø85x142 (3.35x5.6)	Ø106x<188 (4.17x<6.6)	Ø138x<236 (5.43x<5.43)	Ø155x<240 (6.10x<9.45)	Ø180x<281 (7.09x<11.06)
3 stage	mm (in)	Ø55x<106 (106x4.17)	Ø65x<116 (2.56x4.57)	Ø85x167 (3.35x6.57)	Ø106x<221 (4.17x<8.70)	Ø138x<290 (5.43x<11.42)	Ø155x<279 (6.10x<10.98)	Ø180x<333 (7.09x<13.11)
Shaft output	mm (in)	Ø12 (0.47)	Ø14 (0.55)	Ø19 (0.75)	Ø25 (0.98)	Ø32 (1.26)	Ø40 (1.57)	Ø55 (2.17)
Efficiency 1/2/3 stage	%	97/94/90	97/94/90	97/94/90	97/94/90	97/94/90	97/94/90	97/94/90
Protection		IP 65	IP 65	IP 65	IP 65	IP65	IP65	IP65
Torque Nom.	Nm (lb-in)	12-20 (106.2-177.0)	18-30 (159.3-265.5)	40-70 (354.0-619.6)	140-170 (1239.10-1504.6)	215-450 (1902.9-3982.8)	350-700 (3098-6196)	500-1000 (4425-8851)
Torque Peak	Nm (lb-in)	40-60 (354-531)	70-100 (620-885)	180-250 (1593-2213)	360-600 (3186-5310)	800-1300 (7081-11506)	1200-1800 (10621-15931)	1400-2200 (12391-19472)
Rated speed	Rpm	3300 - 4000	3300 - 4000	2900 - 4000	2500 - 3500	2100-3200	1900-3000	1500-2900
Typical input flanges		Nema23	Nema23, 50/70	NEMA34, Nema43, 50/70, PAM70	NEMA43, PAM70, 110/145	NEMA43, PAM70, 110/145	PAM70, 110/145	PAM70, 110/145
Typical motors		MAC050-141 MIS23 MST23	MAC050-141, MAC400 MIS23, MIS34 MST23, MST34	MAC400-800 MIS34, MST34, MIS43, MST43	MAC800 MAC1500 MAC3000, MIS43, MST43	MAC800, MAC1500 MAC3000	MAC800, MAC1500 MAC3000	MAC800, MAC1500 MAC3000

Features of MP series

- Available in either standard or reduced backlash

- Bearings are rated for an average service life of 20,000 hours under nominal operating conditions.
  As standard, frame sizes HTRG08, HTRG06, HTRG08 and HTRG10 feature rigid ball bearings. On request, taper roller bearings can be supplied on units HTRG08 and HTRG10 specifying option CR which are standard at HTRG13-19.

- The gearbox is filled in the factory with a lubricant suitable for ambient temperatures in the 0°C to 40°C range. The lubricant does not normally require changing unless it becomes contaminated from outside.

- The type of lubricant used (grease or synthetic oil) and the material used for the seals also vary according to duty rating and gearbox size. The table below illustrates the various combinations:

duty	HTRG05-06	HTRG08-19
S1	G/V	O/V
S5	G/NBR	G/NBR

Legend:

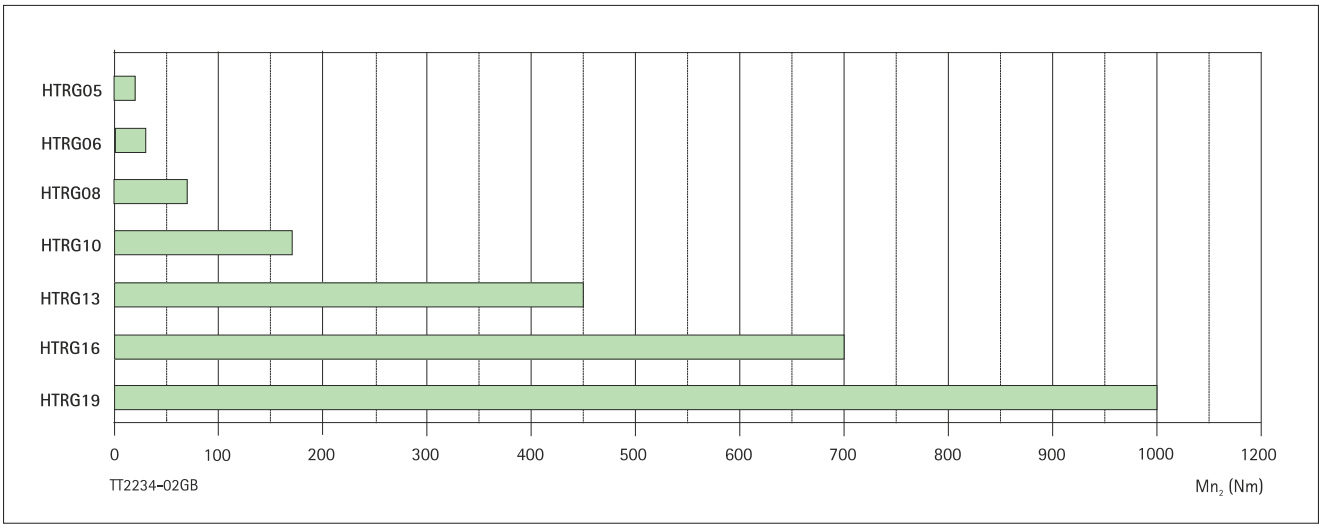
S1 = Continuous duty
S5 = Intermittent duty

V= Viton® seals
NBR = Nitrile rubber seals

G = Grease, consistency 00
0 = Synthetic oil, viscosity ISO VG 220

Features

- Degree of protection IP65
- Noise level $L_p \leq 70$ dB(A) $-n_1 = 3000$ min^{-1}
- Numerous input options
- Ratio i = 10 available for single-reduction units (i=9 for frame size 053 alone)



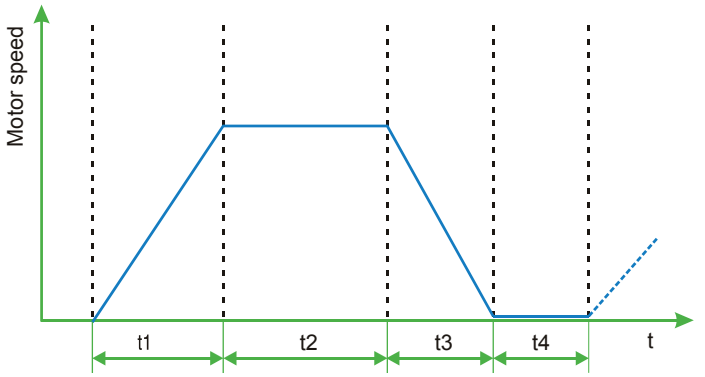
Flange	Motor	Shaft-D	N	N1	N4
	Typical types on stock	mm	mm	mm	
HTRGxxNxxxMHN123106J	MIS230-233, MST230-233	6,35	38,1	66,6	M4x10
HTRGxxNxxxMHN123110M	MIS234, MST234	10	38,1	66,6	M4x10
HTRGxxNxxxMHN134109J	MIS340-341, MST340-341	9,35	73	98,4	M5x12
HTRGxxNxxxMHN134114M	MIS342, MST342	14	73	98,4	M5x12
HTRGxxNxxxMHN143119M	MIS43, MST43	19	55,5	127,7	M6x16
HTRGxxNxxxMH050114M	MAC400, MAC402	14	50	70	M4x10
HTRGxxNxxxMHP70119M	MAC800	19	70	90	M5x12
HTRGxxNxxxMHS40224M	MAC1500, MAC3000	24	110	145	M8x20

Calculating and selecting the size of a gearbox

The following 2 pages show how to calculate and select the size of a gearbox.
You can either calculate the gearbox you need yourself or send the information about the application and the way you want the motor or mechanical parts to move to JVL and we can do the calculation and find the best solution for you.

If we have to make the calculations, we need the this information and also some information about the mechanical system like weight, pulley size, spindle size, etc.

Determination of Intermittance I:



$$I\,[\%] = \frac{t1 + t2 + t3}{t1 + t2 + t3 + t4}$$

t1= starting time. t2= operating time at constant speed. t3=stopping time. t4= rest time.

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1) Determine the applicable duty for the application:
Z = no. of acc per hour.
S5 = Cyclic duty.
S1 = Continous duty.
M_{n2} = Continous torque.
M_{a2} = Peak torque.
M_{1max} = Max. motor torque.

	Z≤1000	Z>1000
I<60%	S5	S1
I>60%	S1	S1

2) Determine service factor f_z

Z	f_z
Z≤1000	1.00
1000<Z≤1500	1.25
1500<Z≤2000	1.50
2000<Z≤2500	1.75
2500<Z≤3000	2.00
Z>3000	contact us

3) determine cycle factor f_c

I	20%-60%	80%	100%
f_c	1.00	1.20	1,40

4) search for the gear unit for which the condition is verified:
At S1, cyclic duty:

$$M_{n2} \geq M_{1max} \times i \times \eta \times f_Z \times f_c$$

$$M_{1max} \leq \frac{M_{n2}}{i \times \eta \times f_Z \times f_c}$$

At S5, continous duty:

$$M_{a2} \geq M_{1max} \times i \times \eta$$

$$M_{1max} \leq \frac{M_{a2}}{i \times \eta}$$

Examples:
MAC140 motor + gear
HMGH05N010
Cycle duty (S5)

t_1 0.5 sec.
t_2 3.0 sec.
t_3 0.5 sec.
t_4 8.0 sec.
12.0 sec.

When $t_1+t_2+t_3+t_4$=12.0 sec. then:
Z=600 (2 acc. per 12 sec.)

$$M_{1max} \leq \frac{10.7}{10x0.8} = 1.3375 \text{ Nm}$$

Continous duty (S1)

t_1 0.1 sec.
t_2 2.2 sec.
t_3 0.1 sec.
t_4 0.6 sec.
3.0 sec.

When $t_1+t_2+t_3+t_4$=3.0 sec. then:
Z=2400 (2 acc. per 3 sec.)

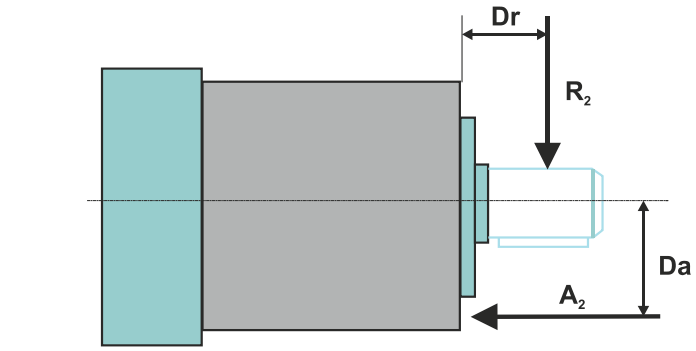
$$M_{1max} \leq \frac{6.76}{10x0.8x1.75x1.2} = 0.40 \text{ Nm}$$

Note:
If, under particular operating conditions, a housing temperature higher than usual is to be expected, it is recommended that Viton® seals are specified at the time of order through option **S1**.
Under no circumstances the maximum speed [n_{1max}] permitted for the gear unit should be exceeded.
Should the surface temperature exceed 90°C it is recommended that speed is reduced, or an auxiliary cooling system is provided.

Service life of bearings

Whether bearings are ball type (CS) or taper roller type (CR), their service life can be calculated through the equations where actual radial and axial forces are accounted for.

HTRG05	HTRG06	HTRG08	HTRG10	HTRG13	HTRG16	HTRG19
CS	CS	CS (opt. CR)	CS (opt. CR)	CR	CR	CR



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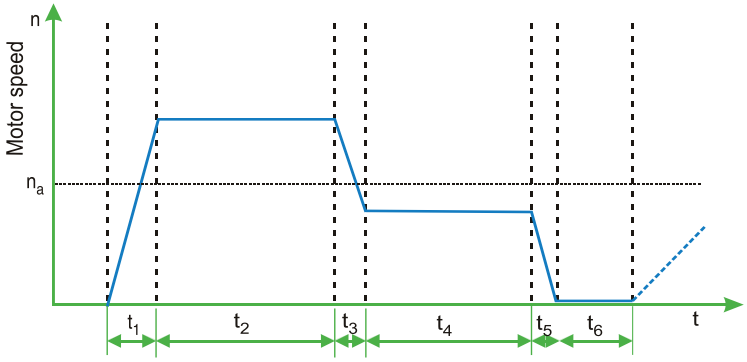
A_2 (N)	Offset axial force
R_2 (N)	Radial force
Da (mm)	Distance of axial force from shaft centre
Dr (mm)	Distance of radial force from mounting flange

Service life - calculation for rigid ball bearings (CS)



$$F_{eq} = \frac{A_2 x D_a + R_2 x (D_r + b)}{a}$$

$$n_a = \frac{n_1 x t_1 + n_2 x t_2 + \ldots + n_5 x t_5}{t_1 + t_2 + t_3 + t_4 + t_5 + t_6}$$

$$L10(h) = \frac{16666}{n_a} \times \left(\frac{c}{F_{eq}}\right)^3$$

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Load location factor - CS	HTRG05	HTRG06	HTRG08	HTRG10
a	15.5	14.4	21.5	24.5
b	17	17.4	32.3	36
c	5600	9550	14000	25700

Load location factor - CR	HTRG08	HTRG10	HTRG13	HTRG16	HTRG19
a	28	35	45	52	62
b	38,55	36	51,75	56,75	64,25
c	30800	51200	76500	99000	140000

F_{eq} [N] = Equivalent force resulting from radial and axial forces applying simultaneously.
n_a [min^{-1}] = Mean output speed.
L_{10}(h) = Theoretical service life of bearings.

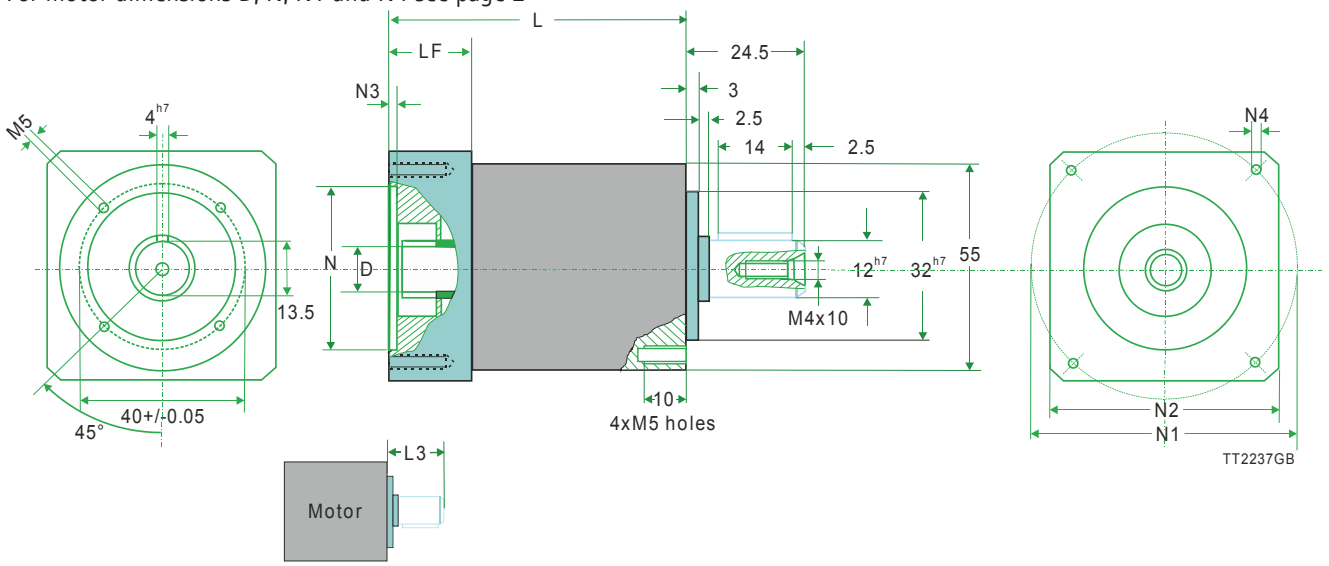
Calculate e = A2/Feq and check that condition **e ≤ 0.19** is verified.
If **e > 0.19** contact our Technical Service.

Symbols and units of measurement

Mn2	[Nm]	**Nominal output torque**
Ma2	[Nm]	**Maximum acceleration torque**, acceptable for a duty with I<60%
Mp2	[Nm]	**Emergency stop torque**. The value can not apply more than 1000 times over the entire life of the gear unit and should not recur in normal operating conditions
n1	[rpm]	**Nominal input speed** (continous duty S1). It is the reference speed for duties with intermittance I>60% and or operating time > 20 min.
n1max	[rpm]	**Maximum momentary input speed**. The speed the unit can be driven occasionally and in non-repetitive conditions. For cyclic duty it can not be applied continously for more than 30 seconds.
φ	[arcmin]	**Standard backlash** is calculated in static conditions and with the application of a torque equal to 2% of the nominal torque for the gear unit,
Rn1, Rn2	[N]	The **admissable radial force** must be equal to, or greater than, the radial force actually applying onto the shaft. Catalogue value is based on output speed n2 = 100 rpm
An2	[N]	The **admissable thrust force** can be applied axially to the shaft under study along. The given value is calculated for an output speed n2 = 100 rpm.
η	[%]	**Dynamic efficiency** is calculated through the relationship of output torque to torque applied to the input shaft under nominal conditions. $\eta_d = (M_2/M_1 xi) \times 100$

Dimensions HTRG05

For motor dimensions D, N, N1 and N4 see page 2

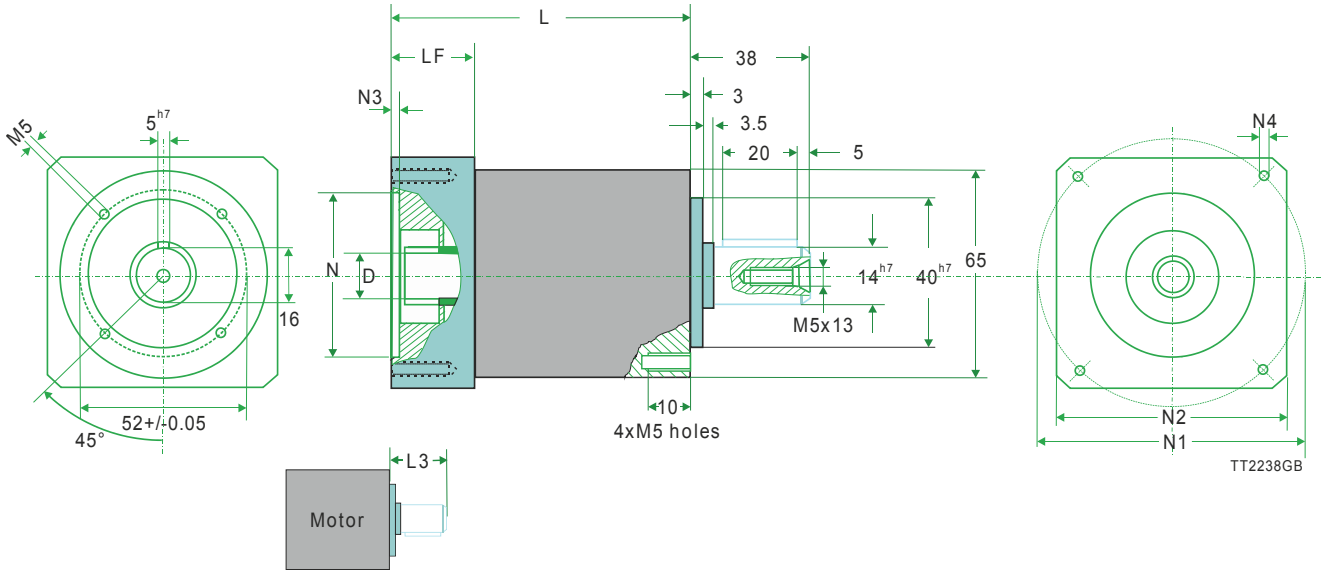


Type	Stages	N2	N3	L3	LF	L	m (w. Flange)	Typical motors
		[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG05N003MHN23106J	1	60	3	25	18	71	1	MIS23/MST23, MAC050-141
HTRG05N005MHN23106J	1	60	3	25	18	71	1	MIS23/MST23, MAC050-141
HTRG05N009MHN23106J	1	60	3	25	18	71	1	MIS23/MST23, MAC050-141
HTRG05N012MHN23106J	2	60	3	25	18	84.8	1,2	MIS23/MST23, MAC050-141
HTRG05N020MHN23106J	2	60	3	25	18	84.8	1,2	MIS23/MST23, MAC050-141
HTRG05N100MHN23106J	3	60	3	25	18	98.6	1,2	MIS23/MST23, MAC050-141

Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[ArcMin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG05N003MHN23106J	12	22	40	3300	4000	15	200	500	600	97	0.06
HTRG05N005MHN23106J	15	28	45	3500	5000	15	200	500	600	97	0.04
HTRG05N009MHN23106J	12	22	40	4000	6000	15	200	500	600	97	0.03
HTRG05N012MHN23106J	20	30	60	3300	4000	15	200	500	600	94	0.06
HTRG05N020MHN23106J	20	30	60	3500	5000	15	200	500	600	94	0.04
HTRG05N100MHN23106J	20	30	60	3500	5000	15	200	500	600	90	0.04

Dimensions HTRG06

For motor dimensions D, N, N1 and N4 see page 2

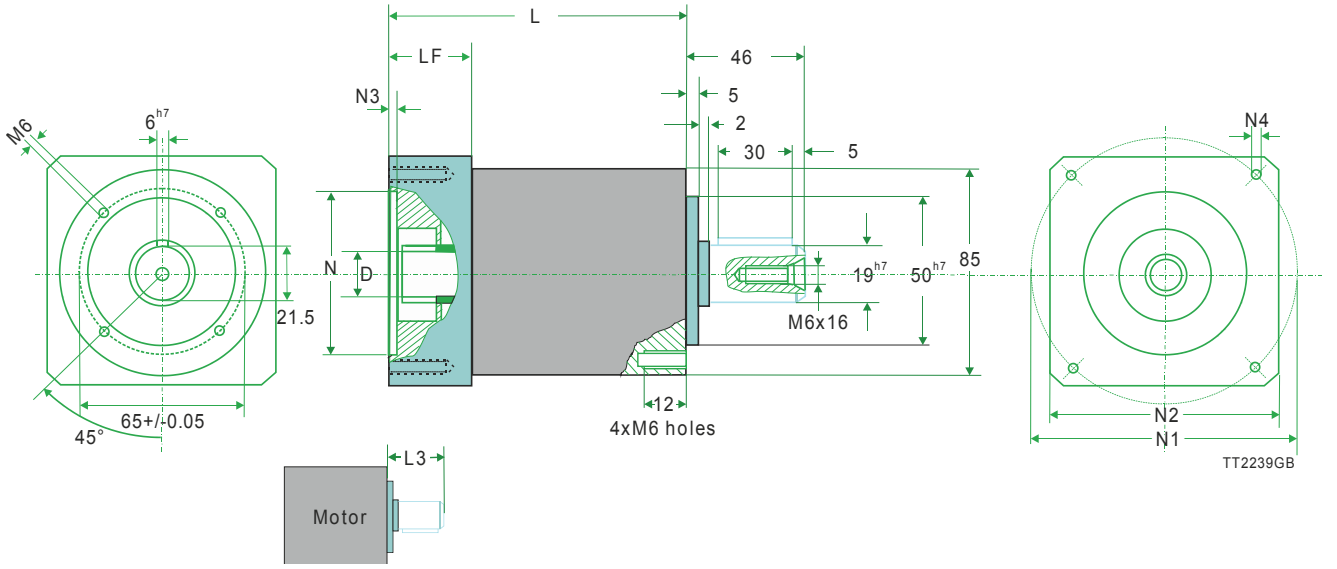


Type	Stages	N2	N3	L3	LF	L	m (w. flange)	Typical motor
		[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG06N003MH050114MC	1	60	3	30	23	80.55	1.5	MAC400, MAC402
HTRG06N005MH050114MC	1	60	3	30	23	80.55	1.5	MAC400, MAC402
HTRG06N010MH050114MC	1	60	3	30	23	80.55	1.5	MAC400, MAC402
HTRG06N012MH050114MC	2	60	3	30	23	97.25	1.85	MAC400, MAC402
HTRG06N036MHN23106JC	2	60	3	25	18	92.25	1.85	MIS23/MST23, MAC050-141
HTRG06N050MHN23106JC	2	60	3	25	18	92.25	1.85	MIS23/MST23, MAC050-141
HTRG06N100MHN23106JC	2	60	3	25	18	92.25	1.85	MIS23/MST23, MAC050-141
HTRG06N003MHN34109JC	1	60	3	32	25	82.55	1.75	MIS340-341/MST340-341
HTRG06N005MHN34109JC	1	60	3	32	25	82.55	1.75	MIS340-341/MST340-341
HTRG06N010MHN34109JC	1	60	3	32	25	82.55	1.75	MIS340-341/MST340-341
HTRG06N020MHN34109JC	2	60	3	32	25	99.25	2.1	MIS340-341/MST340-341

Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[ArcMin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG06N003MH050114MC	18	35	70	3300	4000	15	200	600	700	97	0.11
HTRG06N005MH050114MC	25	40	90	3500	5000	15	200	600	700	97	0.07
HTRG06N010MH050114MC	25	40	90	4000	6000	15	200	600	700	97	0.05
HTRG06N012MH050114MC	30	45	100	3300	4000	15	200	600	700	94	0.11
HTRG06N036MHN23106JC	25	40	90	3500	5000	15	200	600	700	94	0.04
HTRG06N050MHN23106JC	30	45	100	4000	6000	15	200	600	700	94	0.03
HTRG06N100MHN23106JC	18	35	70	4000	6000	15	200	600	700	94	0.03
HTRG06N003MHN34109JC	18	35	70	3300	4000	15	200	600	700	97	0.1
HTRG06N005MHN34109JC	25	40	90	3500	5000	15	200	600	700	97	0.05
HTRG06N010MHN34109JC	25	40	90	4000	6000	15	200	600	700	97	0.03
HTRG06N020MHN34109JC	30	45	100	3500	5000	15	200	600	700	94	0.05

Dimensions HTRG08

For motor dimensions D, N, N1 and N4 see page 2

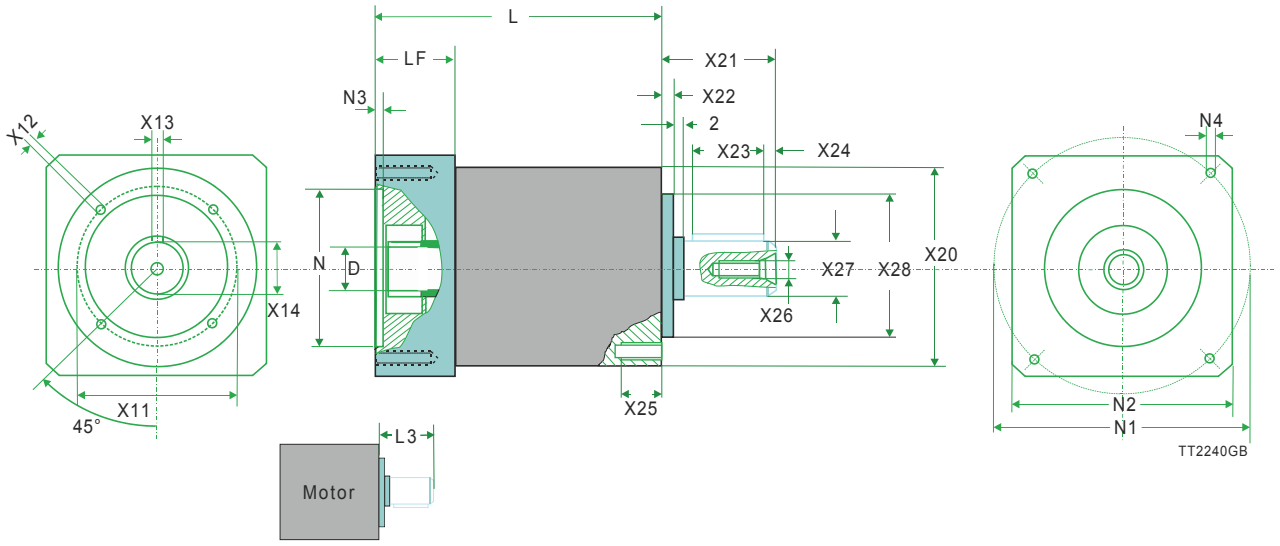


Type	Stages	N2	N3	L3	LF	L	m (w. flange)	Typical motor
		[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG08N010MH050114MC	1	80	4	40	34	117,5	3,85	MAC400, MAC402
HTRG08N012MH050114MC	2	80	4	40	34	142	4.6	MAC400, MAC402
HTRG08N020MH050114MC	2	80	4	40	34	142	4.6	MAC400, MAC402
HTRG08N003MHN34114MC	1	80	4	40	34	117,5	3,85	MIS34x, MST34x
HTRG08N005MHN34114MC	1	80	4	40	34	117,5	3,85	MIS34x, MST34x
HTRG08N010MHN34114MC	1	80	4	40	34	117,5	3,85	MIS34x, MST34x
HTRG08N003MHP70119MC	1	80	4	40	34	117,5	3,75	MAC800
HTRG08N005MHP70119MC	1	80	4	40	34	117,5	3,75	MAC800
HTRG08N010MHP70119MC	1	80	4	40	34	117,5	3,75	MAC800
HTRG08N012MHP70119MC	2	80	4	40	34	142	4,6	MAC800
HTRG08N020MHP70119MC	2	80	4	40	34	142	4,6	MAC800
HTRG08N036MHP70119MC	2	80	4	40	34	142	4,6	MAC800
HTRG08N100MHP70119MC	2	80	4	40	34	142	4,6	MAC800

Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[ArcMin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG08N010MH050114MC	40	80	180	4000	6000	15	400	1300	1400	97	0.29
HTRG08N012MH050114MC	70	100	250	2900	3500	15	400	1300	1400	94	0.56
HTRG08N020MH050114MC	70	100	250	3200	4500	15	400	1300	1400	94	0.36
HTRG08N003MHN34114MC	40	80	180	2900	3500	15	400	1300	1400	97	0.59
HTRG08N005MHN34114MC	50	80	200	3200	4500	15	400	1300	1400	97	0.37
HTRG08N010MHN34114MC	40	80	180	4000	6000	15	400	1300	1400	97	0.29
HTRG08N003MHP70119MC	40	80	180	2900	3500	15	400	1300	1400	97	0.59
HTRG08N005MHP70119MC	50	80	200	3200	4500	15	400	1300	1400	97	0.37
HTRG08N010MHP70119MC	40	80	180	4000	6000	15	400	1300	1400	97	0.29
HTRG08N012MHP70119MC	70	100	250	2900	3500	15	400	1300	1400	94	0.56
HTRG08N020MHP70119MC	70	100	250	3200	4500	15	400	1300	1400	94	0.36
HTRG08N036MHP70119MC	50	80	200	3200	4500	15	400	1300	1400	94	0.29
HTRG08N100MHP70119MC	40	80	200	4000	6000	15	400	1300	1400	94	0.28

Dimensions HTRG10-19

For motor dimensions D, N, N1 and N4 see page 2



	HTRG			
	10	13	16	19
X11	85+/-0.05	110+/-0,05	130+/-0.05	215+/-0.05
X12	M8	M12	M12	13 mm
X13	8H7	10H7	12H7	16H7
X14	28	35	43	59
X20	106	138	155	195x195 mm
X21	57,5	69,5	98	96
X22	5	7	14	13
X23	35	50	70	60
X24	5	3	6	11
X25	M8 X 15	M12 X 20	M12 X 25	13 X 15
X26	M10 X 25	M12 X 32	M12 X 32	M14 X 36
X27	25h7	32h7	40h7	55h7
X28	70h7	80h7	110h7	180h7

HTRG10

Type	Stages	N2	N3	L3	LF	L	m (w. flange)	Typical motor
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG10N015MHP70119MC	2	106	5	40	28	180	8,8	MAC800
HTRG10N020MHP70119MC	2	106	5	40	28	180	8,8	MAC800
HTRG10N100MHP70119MC	2	106	5	40	28	180	8,8	MAC800
HTRG10N003MHS40224MC	1	106	6,5	60	48	167,5	7,7	MAC1500-3000
HTRG10N005MHS40224MC	1	106	6,5	60	48	167,5	7,7	MAC1500-3000
HTRG10N010MHS40224MC	1	106	6,5	60	48	167,5	7,7	MAC1500-3000

Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[arcmin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG10N020MHP70119MC	170	250	600	2500	3500	15	600	1500	1600	94	1.5
HTRG10N020MHP70119MC	170	250	600	3000	4500	15	600	1500	1600	94	0.93
HTRG10N100MHP70119MC	100	180	360	3500	5000	15	600	1500	1600	94	0.38
HTRG10N003MHS40224MC	100	180	360	2500	3500	15	600	1500	1600	97	2.2
HTRG10N005MHS40224MC	140	210	450	3000	4500	15	600	1500	1600	97	1.23
HTRG10N010MHS40224MC	100	180	360	3500	5000	15	600	1500	1600	97	0.85

HTRG13*

Type	Stages	N2	N3	L3	LF	L	m (w. flange)	Typical motor
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG13N100MHP70119MC	2	138	4	50	39,5	205	19,6	MAC800
HTRG13N020MHS40224MC	2	138	4	60	49,5	215	18,6	MAC1500-3000
HTRG13N036MHS40224MC	2	138	4	60	49,5	215	18,6	MAC1500-3000

Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[arcmin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG13N100MHP70119MC	215	400	800	3200	4000	15	800	5500	6500	94	0,96
HTRG13N020MHS40224MC	450	700	1300	2900	3500	15	800	5500	6500	94	2,2
HTRG13N036MHS40224MC	380	600	1100	2900	3500	15	800	5500	6500	94	1,3

HTRG16*

Type	Stages	N2	N3	L3	LF	L	m (w. flange)	Typical motor
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG16N020MHS40224MC	2	140	6,5	60	49,5	229,5	24,2	MAC1500-3000
HTRG16N100MHS40224MC	2	140	6,5	60	49,5	229,5	24,2	MAC1500-3000

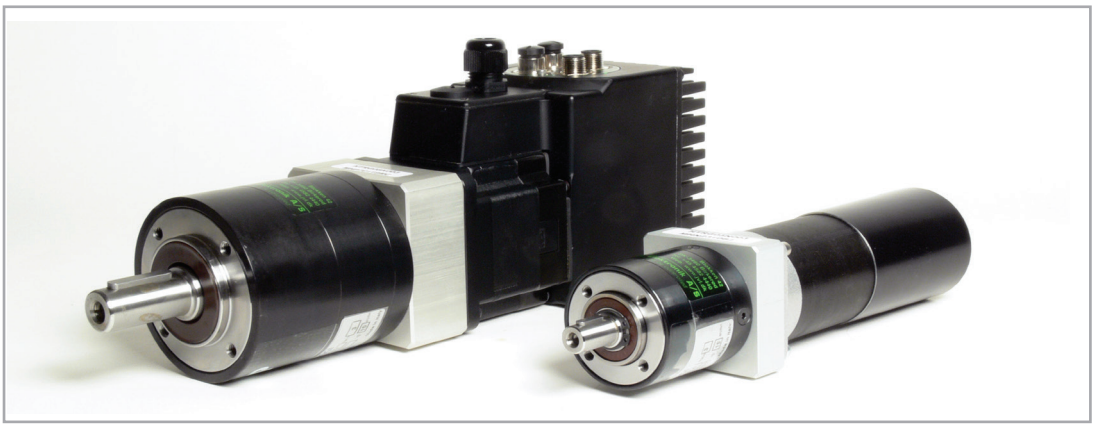
Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[arcmin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG16N020MHS40224MC	700	950	1800	2500	3500	15	1200	6500	7500	94	3
HTRG16N100MHS40224MC	350	660	1200	3000	4000	15	1200	6500	7500	94	1,4

HTRG19*

Type	Stages	N2	N3	L3	LF	L	m (w. flange)	Typical motor
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
HTRG19N020MHS40224MC	2	140	6,5	60	49,5	259,9	31	MAC1500-3000
HTRG19N100MHS40224MC	2	140	6,5	60	49,5	259,9	31	MAC1500-3000

Type	Mn2	Ma2	Mp2	n1	n1max	φ	Rn1	Rn2	An2	η	J
	[Nm]	[Nm]	[Nm]	[rpm]	[rpm]	[arcmin]	[N]	[N]	[N]	[%]	[kgcm²]
HTRG19N020MHS40224MC	1000	1200	2200	2300	3000	15	-	14000	15000	94	8,5
HTRG19N100MHS40224MC	500	800	1400	2900	3500	15	-	14000	15000	94	3,3

* These are typical examples of gearboxes for heavy and duty applications and are not gearboxes we normally have on stock

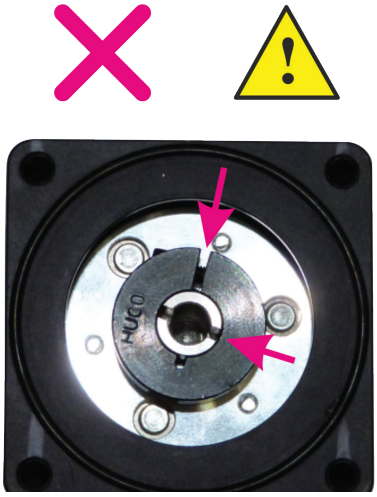


MAC800 and MAC141 integrated servo motors mounted with HTRG gears

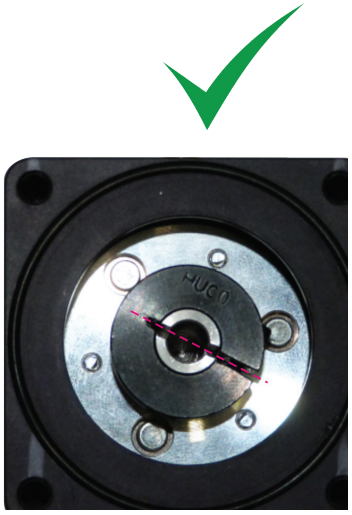
Mounting instructions

When a gear or a brake is to be mounted on the front end of a motor it is very important that this is done in the right way since a wrong way of mounting may have fatal influence at lifetime of the motor or gear/brake and performance.
Please follow this instruction step by step to make sure that the mounting is done with a good result.

Step 1 - Make sure that the shaft collar is oriented correctly in order to assure that the right tension around the motor shaft is possible.
Hint: Tighten the shaft collar gently just to keep it in the right position.

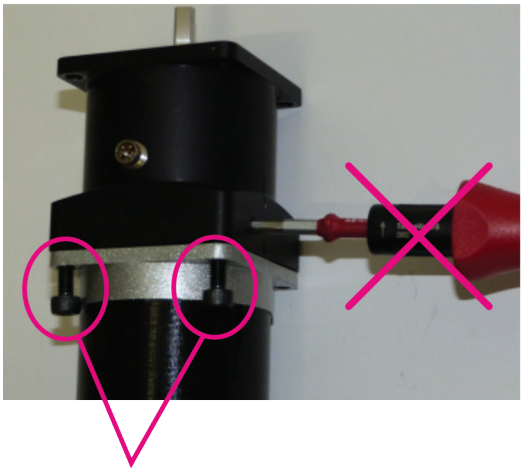


The inner and outer slit is NOT aligned.
Make sure they are aligned as shown
at right illustration



The inner and outer slit
is aligned as they should.

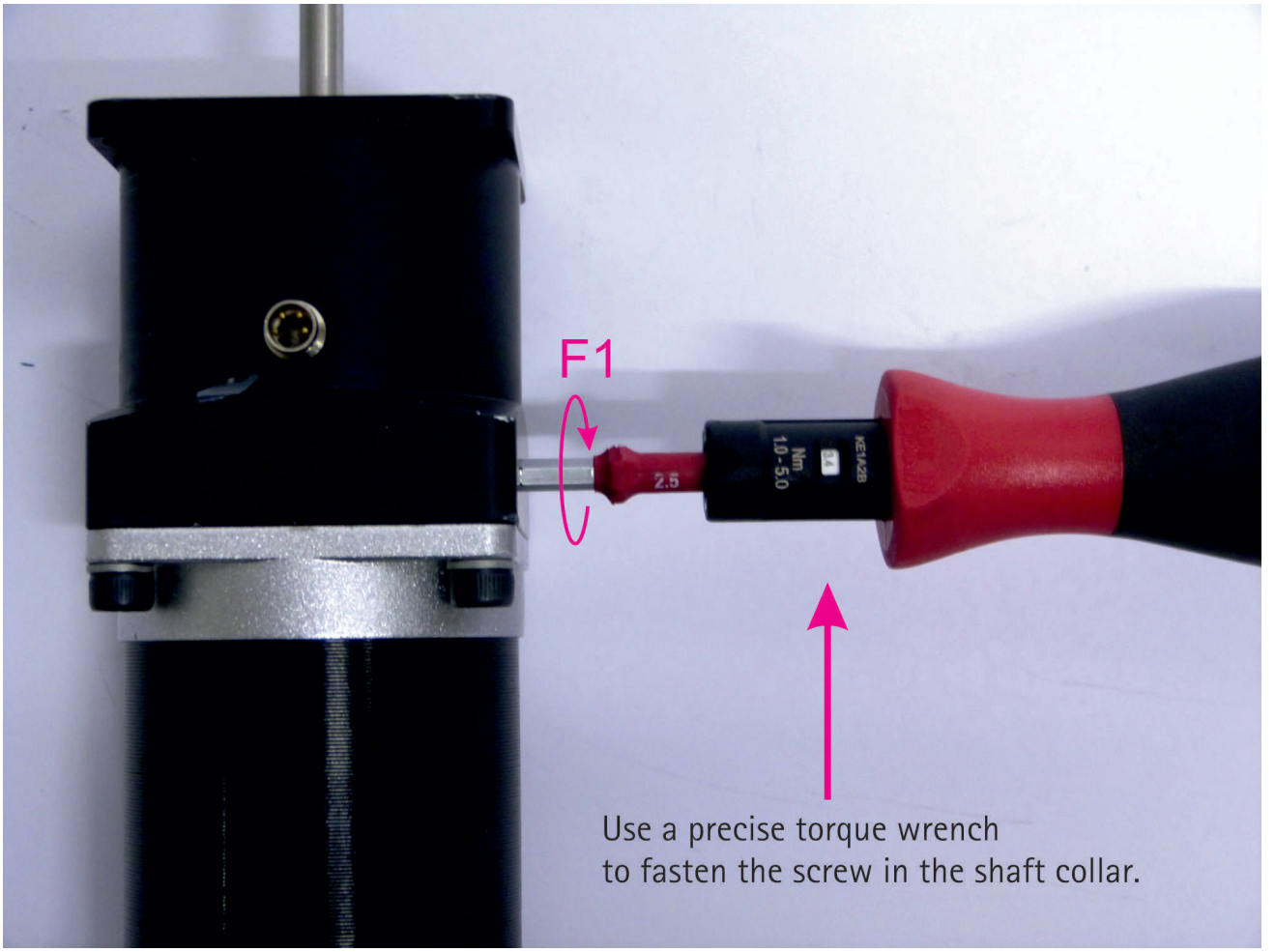
Step 2 - Mount the gear or brake at the motor but make sure to fasten the 4 flange bolts first before fastening the shaft collar. Its recommended to use Locktite 278 in the threats to make sure that the bolts stay in place.



Do NOT tighten the Do NOT tighten
the shaft collar before the flange
bolts are tightend shaft collar
before the flange bolts are tightend

Flange bolts properly mounted and
tightend.

Step 3 - Final stage. Fasten the shaft collar with a torque of according to the scheme below.
Please notice that it can be fatal not to use the specified torque since the shaft may slip over time and cause a position offset.



Recommended Torque for Shaft Collar Screw

Motor shaft diam.	Locking bolt	Tool (Metric)	Tightening torque (F1) (Nm)	Torque transmitted at 20° C (Nm)	Torque transmitted at 90° C (Nm)
6/6.35	M4	3.0 mm	4	9	6
9.52/10	M4	3.0 mm	4	14	11
14	M6	5.0 mm	11	35	25
19	M6	5.0 mm	11	120	90
24	M6	5.0 mm	14	120	90

General Reccomended Tightening Torque

Bolt size	Tightening torque MT2 (Nm) Bolt class		
	8.8	**10.9**	**12.9**
M4	2.9	4.1	4.95
M5	5.75	8.1	9.7
M6	9.9	14	16.5
M8	24	34	40

General Information about the HTRG Gears

ISO 9000 certification:
The manufacturer follows ISO 9001 in its quality control. All components of the gears are tested according to procedures prescribed in the ISO standard.

Materials and manufacture:
The gear housing is manufactured of hardened 38NiCrMo5 steel that is phosphate coated for extra protection. The gear wheels are manufactured of case-hardened 18 NiCrMo5 steel. The gear teeth are all ground finished. In models that use taper roller bearings, the surface of the planetary gear wheels are pieced together to provide optimum alignment. (Models HTRG05 and HTRG06 do not use taper roller bearings due to space requirements. These models use rigid ball bearings.) The taper roller bearings are Cr100 bearings to achieve the highest precision. NSL and INA bearings are used. The output shaft is manufactured of ground finished hardened 38NiCrMo4 steel.

Tolerances:
The axial and radial slippage are a few hundredths of a mm, corresponding to C3-class bearings. The standard gears have a backlash of less than 15′ from the input shaft to the output shaft. Models are also available with less than 10′and 5′ backlash. Model MP053 is also available in a less expensive version with 30′ backlash. The backlash is measured at a torque of 10% of the gear's rated torque. Within the ranges specified here, the backlash is dependent on the selected gear ratio. The backlash of a planetary gear is not dependent on the number of stages, but on the gear ratio of the individual stages. The slippage in the stages before the output shaft is reduced by the stage's own and each subsequent stage's gear ratio.

Temperature:
All components of the gears, including seals and O-rings, can withstand temperatures up to 100°C. During continuous operation the temperature of the gears can reach 70 to 80 °C.

Sealing:
The gears fulfil IP65 requirements. IP66 requirements can also be achieved if the coupling between the motor and gear is sealed using silicone and the gear housing is painted with protective paint. The gear output shaft is however not stainless steel.

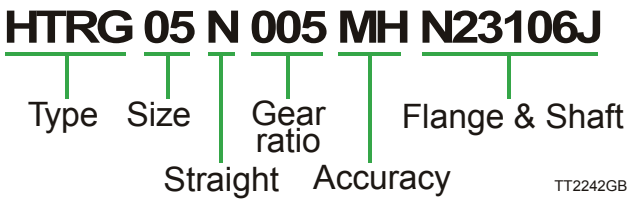
Lubrication:
The gears are lubricated with a 00-density lubricant, Klubersynth GE-46 1200. This lubricant ensures good lubrication even at the very high rotational speeds at which planetary gears operate. It may also be possible to use a lubricant of the type Castrol OPTIMOL, but this has not been fully tested.

Drawings:
Engineering drawings of the gears can be downloaded from our website in different formats. If you can't find the drawing you're looking for, please ask JVL.

Gearing:
It is not recommended to use the gears 'in reverse', i.e. for gearing up. It is possible to do this at very low torques, maximum 5Nm for HTRG05 and HTRG06, and maximum 10 Nm for HTRG08 and HTRG10. It is however very risky due to the large speeds attained by planetary gears and the manufacturer recommends it is not done.

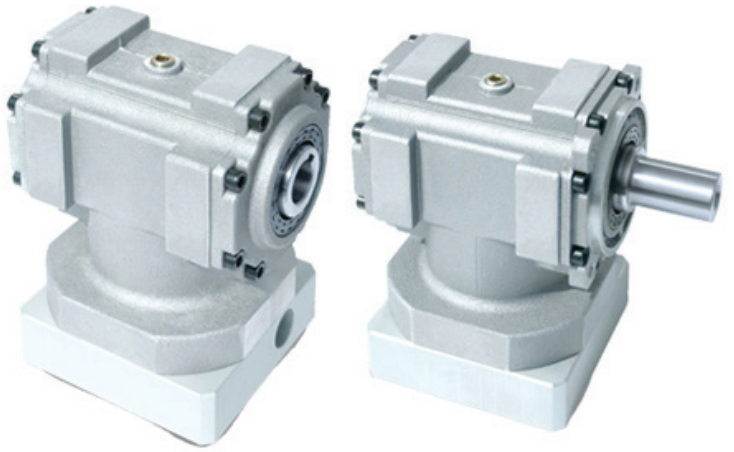
Lifetime:
The gears are supplied with a 1-year guarantee on mechanical failure of components. The lifetime of the gear depends on the rotational speed and the radial load. It will typically be 10.000 hours or more. Lubricant supplier, Kluber, specifies a lifetime of 18000 hours for the lubricant under continuous operation of the gears within the specified torque range.

Gear order numbering system



For full information on gear order numbering please contact JVL

Angled Gears



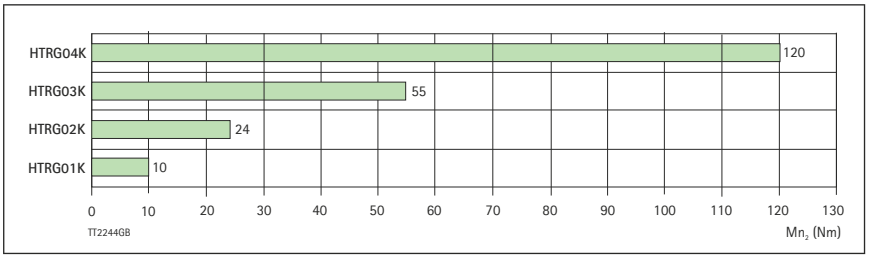
Bevel helical units type HTRGxxK, manufactured under the most stringent quality specifications, are designed for dynamic and accurate applications where light weight and space effectiveness are a factor. Many options can be selected as far as motor adaptors and output shaft configurations that facilitate the installation on the driven equipment, are concerned

- Available in one backlash option (φ = 8´)
- Single reduction; ratios i = 1, 2, 5
- Radial ball bearings are of standard supply, while taper roller bearings can be optionally specified for particularly demanding loading conditions.
- Protection IP65
- Max. noise level LP ≤ 70dB(A) @ n_1 = 3000 min^{-1}
- Units are factory charged with synthetic lubricant suitable for operation at ambient temperatures in the range 0° to 40°C. The lubricant quantity is affected by mounting position, which therefore will have to be specified at the time of ordering. In the absence of contamination lubricant does not require periodical changes. The type of lubricant, whether grease or oil, depends on type of duty, as charted below:

duty	HTRG01K	HTRG02K	HTRG03K	HTRG04K
S1	O/V	O/V	O/V	O/V
S5	G/V	G/V	G/V	G/V

Legend:
S1 = Continuous duty
S5 = Intermittent duty
V= Viton® seals

O = Synthetic oil, viscosity ISO VG 220
G = NLGI Grease, consistency 00



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